Status of Demand Response in Europe

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EPFL Lausanne Switzerland
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The Smart Energy Demand Coalition (SEDC) is an European Industry Association with approximately 45 members.
“In order to change the future you must challenge the present”

The SEDC Moto

DR is the only none-subsidized resource in the energy markets today
**Demand Response – The People Power Resource**

**Why Care? USA -** As of 2014, over 3.5* billion Euros earned by the local economy annually through Demand Response

7 years after market opening 29 GW under Demand Response programs

- USA Multi Billion $ Business Direct Revenue + avoided investments in generation
- Demand Response “took off” in 2005 with Demand Side access to capacity markets
- Average estimate peak clipping 8-11% US (FERC)
- Average estimate possible peak clipping 6-13% Europe (SEDC)
- Developed & developing nations looking at DR for peak clipping purposes: Canada, Australia, South-Korea, Singapore, Japan, India, Brazil, China etc.

A total of 66 GW were under some form of control, making up 9% of total US national capacity (source FERC)

*Joule Assets*
Aggregation Seviced **KEY** for successful DR
Aggregator can be third party, utility, or retail supplier

The aggregator collects multiple customers with multiple loads:
- electric heating
- freezers
- refrigeration
- fans
- lighting
- pumps
- grinders
- smelters, ...

**Aggregated Demand Response:** a reliable source of flexible capacity

**Reduction MW vs Committed MW**
July 22, 2011

PJM 2011 Final Emergency Load Management (ILR/DR) and Economic Demand Response summary.
8/17/2009: Via phased DR, 75MW of expensive generation avoided
State of the Art Integrated, Automated Demand Response for Control Centers

Increasing Interactions with Grid (OpenADR & Smart Grid)

Resources Sold Back to Grid

Daily Energy Efficiency
Daily Time-Of-Use Energy (TOU Rates)
Dynamic Peak Load Management (Dynamic Rates)
Scheduled Demand Response
Real-Time Demand Response (Ancillary Reserves)
Regulation (Ancillary Services)

Service Levels Optimized
Time of Use Optimized
Service Levels Temporarily Reduced

Increasing Levels of Granularity of Control
Increasing Speed of Telemetry

Demand can participate:
- 2 second, 30 second, 2 min 1 hour, intra-day...

Source: LBNL
SURVICE IS KEY
Demand Response Back Office

Operators see need for event → Event calls are made to customers → Customers change their consumption → Operators monitor response, then releases customers → Customer load returns to normal

Identify → Notify → Curtail → Monitor → Restore

Source: Comverge
• **Handle communication, registration requirements**
  - Real-time metering takes place at the level of the aggregator
  - If necessary, then passes on the individual measurements of the consumers’ actions
  - Handle measurement and verification requirements
  - Secure standardization of communication interfaces

• **Calculate and report baseline and saving change**
  - Use an already existing methodology that has been proven to be sufficiently accurate to allow for fair payment and adequate reliability

• **Handle penalty and payment structures (for example reserves)**
Aggregation enables reliability

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Business models
DR Success is a Process

May need different requirements from different resources to deliver the same product

Market development is a process – gain one level of uptake then adjust

Pay attention to product details and requirements
**Industrial consumer**

**TSO**

**Panasonic Client**

**Tariffs/sole service**

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**Value Areas for Market Players**

**Potential**
- Low Potential if this is the only market
- Technology Provider: Bundle software

**Strategy**
- Use as a differentiator
- First entrant advantage

**Risk: Types of Response**
- Low risk
- Money spent developing software

**National Markets**
- Poland
- Italy
- Spain
- Slovenia

**Aggregators**
- Cyber Grid (sole service)
- Flexitricty (Tariff)

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**Market Structure**

**Developed TSO**

**MW or MWh**

**Aggregated Loads**
- Lighting
- AC/Heating
- Pumps
- Air compressors
- Backup generation
- Grinders
- Water heaters
- Elevators

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**Cyber Grid** (sole service)

**Flexitricty** (Tariff)
Function of Aggregation

Value Areas for Market Players

Consumer
- Direct revenue
- Do-good
- Use of back-up generation
- Control

Government
- Security of Supply
- Justification Smart Grid
- Value to voters
- Avoided investment
- Green
- Increased wind and solar

Generation
- Energy Management System
- Bidding potential into new markets,
  Lower cycling costs,
- Increase efficiency...
- New communication requirements fulfilled...

ISO/Market
- Policy – affordable, sustainable, reliable
- Best mix for assets
-Enlarge market for existing power plants
- Virtual power plant product

Retailer
- Service to customers
- Control of purchasing risk
- Green
- Revenues
Other:
Example: Issues

- Lack of standardised baseline
- Complex contracts
- No pooled pre-qualification
- No realistic duration and minimum load requirements
- Penalties through network tariffs
- No appropriate settlement processes
- No access to historical data

Can find all or a selection of these other barriers throughout the EU
4 Steps to successful Demand Response
Step 1- Involve the Consumer

*Critical issue, difficult in **majority** of Member States*

1. Consumers require a **clearly defined offer**, which is both simple to use and contains clear benefits.
2. They require a **provider** this offer
   * an independent aggregator or a retailer.

**Requirements for success:**

1) **Legality:** Demand must be accepted as a resource in the markets
2) **Access:** Consumer’s should have access to service providers without interference from potential competition
3) **Standardized process:** A standardized process is required for the BRP-Aggregator as described in EG3
4) **Bi-directional payment BRP-Aggregator:** The BRP requires payment for sourcing costs.
Step 2 – Baseline & Measurement Requirements

*This issue tends to be resolved as market matures*

Measurement and verification protocols

measurement ensures fair payment.

Requirements for success

- **Baseline** and measurement standardization
- *(A single consumer may be face contradictory requirements from his/her retailer, TSO and DSO).*
- Measurement technology – though this is supplied during the program OR – access to standardized data
Baseline depend on the duration of the activation and the lead-time prior to activation.

1) They range from extrapolating (flat) the last value for limited duration event with no lead time (this is the case for tertiary reserve in Belgium for example) to more elaborate extrapolation based on the curve of the last 8 from 10 days rescaled to the actual consumption just prior to the notification for longer events with longer lead times (such as strategic reserves in Belgium or capacity market in the UK).

2) The current baseline solutions used in balancing markets have proven to be up to the task and mature.

3) There is significant literature available on baselines.
Step 2 – Balancing BRP
Critical to refine roles and responsibilities

DR is designed to be activated only a few hundred hours a year (adequacy, tertiary reserves, exceptional market conditions on intra-day market …) therefore the split responsibility on the access point is only applicable for these exceptional situation and not the remaining more then 8000 hours of the year.

This process is described within the Electricity Balancing Network Code by ENTSO-E. Is currently under review by the Commission
Step 3 – Create viable products

Progress made in several Member States
Products/programs that fit Consumer capabilities

Requirements for success:
**Historic regulation:** Participation requirements in markets historically directed toward the needs of the national generators.

Now must be adjusted to maximize the use of a range of resources included demand and renewables

**Allowing consumer participation**

- **Product Design:** It is critical that participation requirements for a market allows a range of resources to participate, including demand side resources.
Step 4 – Ensure fair payment

Pay equality has seen little progress and is an issue in a majority of Member States

Transparency and Equal Pay!

All resources, including demand side resources, should be paid the full value of services provided!

Requirement for success:

Equality: Today Demand Side Resource are not always paid the MW to MW as generation for the same resource

Transparency: Prices are often set through bilateral agreements, are not published, and are not transparent.

Value for Flexibility: The value of flexibility is not currently reflected in current market structures

Standardized bi-directional BRP-aggregator payment methodology: to ensure transparent smooth are required for development
Industrial DR business activity

Key:
- Commercially available
- Partial opening
- Preliminary development
- Closed

2013

2015
Residential DR business activity in Europe EE and DR....

Key

- **In - place**
- **In place but not functional**
- **Planned**
- **STRIPIES: Partial**

**2015**

- Dynamic pricing mandated
  - In the Nordics

Retailers testing with mixed results

- Dynamic pricing will be possible
  - Is not now

Prices are largely regulated – split between DSO and Retailer addressed

TOU not need reflective and too low for consumer value

Dynamic pricing mandated
Questions?
Thank You

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Step 1 - Involve the Consumer

Contractual Relationships

Without standardised process

BRP

Customer

TSO

Retailer

Aggregator

Data exchange agreement and confirmation document for prequalification

Service contract

Prequalification, nomination and delivery of balancing services

Agreement on financial adjustment\(^1\)

Confirmation for prequalification, Ensure handling of DSO curtailment events

\(^1\)An alternative way is an agreement between customer and retailer
Contractual Relationships
Switzerland, Belgium, France

BRP

Retailer

Aggregated Data exchange – balancing adjustment

Standardised financial adjustment

TSO

Prequalification, nomination and delivery of balancing services

Confirmation for prequalification, Ensure handling of DSO curtailment events

Customer

Service contract

Aggregator

Commercial Contract

Standardised process

DSO
8/17/2009: Via phased DR, 75MW of expensive generation avoided
Step 4 – **Ensure fair payment**

Lost sales for retailer

Payment of sourcing costs

Bought electricity
Part of balancing responsibility
And retailer function

Purchased electricity which cannot bill

A few Retailers look for payment of full costs, which they calculate, generation, retailer, profits…
Issue – BRP- Aggregator

The SEDC promotes:

1) **Standardized Payment/Settlement:** Payment methodologies should be standardised but should follow market development
   1) A mix of forward and day ahead prices
   2) An average price which follows the market
   3) A price all BRPs agree upon as a fair methodology

   ‘Energy’ is transferred between market parties

2) **Aggregated Information:** No direct communication of any consumer related data should be provided directly between the BRP and aggregator but **rather aggregated data** for all DR participating in a given area should be transferred through a third party to the BRP